momentary radius of curvature of the path (neglecting the curvature of the earth); F, taken positive in all cases, is any reaction or resultant of the forces per unit mass of the body and arising within the aircraft (a rudder reaction or component of the sustaining air pressure, for example) which acts to turn the flight of the craft to the right or left as may be desired; and the quantity f is here the familiar expression for the deflective force per unit mass of the earth's rotation on a body moving at velocity v in latitude ϕ, viz,

$$2v\omega \sin \phi$$

In the Northern Hemisphere the plus sign in (1) will apply in all cases in which the aircraft turns to the right or clockwise, while the minus sign represents counterclockwise or left-hand turns, with vice versa effects in the Southern Hemisphere.

Our present purpose is to examine the results required to satisfy equation (1) under conditions which may ordinarily occur. Solving for r we get for forces on unit mass

$$r=\frac{v^2}{F\pm f}. \qquad (2)$$

Confining attention to velocities of 40 meters per second at latitude 50 we have for r in meters

$$r=\frac{160000}{F\pm .4469 \text{ dynes}} \qquad (3)$$

plus for right-handed, minus for left-handed turns.

Solving equation (1) for v we get:

$$v=\sqrt{Fr+(r\omega\sin\varphi)^2}\pm r\omega\sin\varphi \qquad (4)$$

plus for right-hand and minus for left-hand turns.

For a left-hand turn of a given radius, we see from (2) that F will require to be greater, by nearly one dyne (0.893 dyne) per gram of mass than for a right-hand turn, at the same velocity.

This may be a matter of some consequence because when an airplane swings into a turn with normal bank, the forces F and the weight of the craft are sine and cosine components of the sustaining air pressures. Accordingly, the smaller the force F the more completely the weight of the machine is supported and the less the loss of altitude, which is unavoidable in any case.

Applied to gliding, equation (4) indicates that the glide may be prolonged by executing a long turn to the right rather than to the left. For maximum effect, F must become zero and involve no banking, thus affording maximum support with $v=2r\omega\sin\phi$. To execute the same glide in a left-hand turn, the value of F would require to be $2f$, accompanied by corresponding banking and loss of sustaining effort.

When a machine is climbing under a given expenditure of power and along a curved flight, the ascent will be more rapid clockwise than counterclockwise.

When a pilot sets out to steer a straight-away course by compass, for example, he always finds himself, even in quiet air, headed away from course in a few minutes. The force F, without his knowledge or intention, has turned the machine to the right or left as the case may be. What are the probable values of F in such cases?

Let us assume the pilot disregards deviations from course that are less than one-quarter point of the compass, say, about 3°. Also, assume that on the average he must rectify his course once every 60 seconds, that is, the forces $F+f$ turn his craft 3° from course every 60 seconds.

From these data it is easy to show that for right-hand turns at 40 meters per second, latitude 50°, F must be 6.812 f, and for left-hand turns, 8.812 f, in which, under the assumed conditions $f=0.447$ dynes. F and f, it must be remembered, are forces per gram of moving matter.—*C. F. Marvin.*

WEATHER MAPS IN LONDON NEWSPAPERS.

On January 1 the Morning Post [and later the Times and Daily Telegraph] commenced the publication of the daily weather chart prepared by the Meteorological Office from the 6 p. m. observations. The area included extends from Iceland in the northwest to Corsica in the southeast, the British Isles having a central position and the west of continental Europe, from Scandinavia to the Pyrenees being shown. Isobars are given for intervals of 5 millibars, and the lines are numbered at one end with the pressure in millibars, at the other with the height of the mercurial barometer in inches and hundredths. As the map extends across two columns it is very clear and legible, a great advance on any previous presentation of a weather chart in a British newspaper.

In introducing the new feature the Morning Post, under the heading of "A fascinating daily study," started a series of meteorological articles with the happy quotation from Ruskin:

"While the geologist yearns for the mountain, the botanist for the field, and the mathematician for the study, the meteorologist like a spirit of a higher order than any, rejoices in the kingdom of the air."

The writer understands that a new era in public appreciation of meteorology began with the armistice, and he says: "In all educational establishments, from the universities, through the training colleges, down to the elementary schools, familiarity with the daily Weather Map, and its indications, has now become an imperative necessity. Lectures based upon the many erroneous theories of pre-Weather Map days which are found in most textbooks, and illustrated by diagrams of a generation or half a century ago, are out of date—they are the dried-up, lifeless bones out of which there comes no sustenance. What is now required is the living thing, something that appeals to and interests the scholar because he feels that he is being taught to appreciate what he is experiencing at the moment. This living thing is the Weather Map which a very large proportion of the readers of the Morning Post will have served up with breakfast every morning, and in more distant regions by midday."[1]

The Post and Times both give a description of the general conditions prevailing at 6 p. m., together with the changes then in progress and their probable effect on the weather conditions likely to be experienced over the British Isles during their course. The needs of aviation are also provided for, and a table is given each day in the Times showing the direction and velocity of the wind at 2,000, 5,000, 10,000, and 15,000 feet above the ground.

This information as now supplied is far more complete than was possible in the early days of the war, and should help to stimulate an intelligent interest in meteorological matters among the general public.

Wireless reports from ships out at sea are, it is understood, to be added to the reports as soon as the new service is organized.[2]

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[1] From Symons's Met'l Mag., Feb., 1919, 54: 1-2.

[2] Quart. Jour. Roy. Met'l Soc., London, Jan., 1919, vol. 45, p. 83. See also Nature, London, Jan. 30, 1919, p. 427, and Sym. Met'l Mag., Mar., 1919, p. 19.